MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

DCS5068-DATA STRUCTURE & ALGORITHMS

(DIT)

12 MARCH 2018
2.30 pm – 4.30 pm
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** pages.

2. Answer **ALL** questions in the answer booklet provided.

Instruction: Write your answers in the answer booklet provided. Total is **100 marks**.

QUESTION 1

a) Write the output displayed by the following C++ program. (4 marks)

```
int a[4] = {2,4,6};
int *ptr, x=10, y=20, i;

ptr = a;
ptr[2] = x + (*ptr+1);
*ptr = y++;
int &z= x;
z = y + 2;
ptr = a;
*(ptr + 3) = *ptr + 2;

for(i = 0; i<4; i++)
  cout<<a[i]<<" ";
cout<<endl;

cout<<x<<" "<<y<<" "<<z<<" "<<endl;
```

b) Re-write the following nested *if...else* statement into *switch* code segment. (6 marks)

```
if(gender == 'M')
{
  if(age == 1)
     cout<<"Ticket price is RM200"<<endl;
  else if(age == 2)
     cout<<"Ticket price is RM400"<<endl;
}
else if(gender == 'F')
{
  if(age == 1)
     cout<<"Ticket price is RM150"<<endl;
  else if(age == 2)
     cout<<"Ticket price is RM300"<<endl;
}
```

Continued ...

c) Write a complete C++ program based on the following requirements and sample output in **Figure 1**. (15 marks)

- Construct a class name *Salary*.

  Private members are :
  - *basic, total, EPF, Tax, OTpay, nettpay* : type float
  - *hours* : type integer

  Public members are :
  - *void GetInput ( )* - get the basic salary and hours over timed.
  - *void Calculate* ( ) - calculate total overtime, total income, EPF deduction, tax deduction, total deduction and net salary. Assume the rate for over timed is RM50.00 per hour, EPF is 11% from the total income and Tax is 5% from the total income.
  - *void Display ( )* - display the Salary Payment Slip as shown in sample output .

Sample Output:

```
Enter basic salary    : RM2000.50
Enter hours over timed: 6

Salary Payment Slip

Income
************************
Basic Salary : RM2000.50
Overtime : RM300.00
Total Income : RM2300.50

Deduction
*************************
EPF : RM253.055
Tax : RM115.025
Total Deduction : RM368.08

Net Salary : RM1932.42
```

Figure 1

[Total 25 marks]

Continued ...

QUESTION 2

a) Convert the following postfix notation to infix notation and write the final value. (2 marks)

8 3 2 4 + * + 2 /

b) Write the prefix notation for the following infix notation. (2 marks)

A + (B * (C – D)) / (E + F)

c) **Figure 2** is a linked list with four elements.

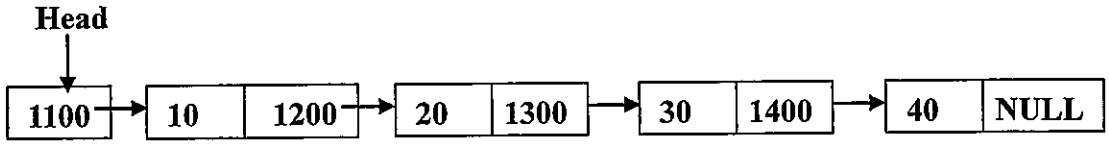


Figure 2

i) Complete the following **Table 1** with the correct value. (4 marks)

	Value
head→data	
head→next	
head→next→data	
head→next→next→data	

Table 1

ii) Based on **Figure 2**, complete the program below to print all the element in the linked list. (4 marks)

```
node *head, *current;
_____(i)____ = head;
while(_____(ii)_____)
{
cout<<_____(iii)____<<endl;
current = ___(iv)_____;
}
```

Continued ...

d) **Table 2** below represents an array implementation of a linked list.

Index	Data	Link
0	50	
1	30	
2	10	
3	20	
4	40	

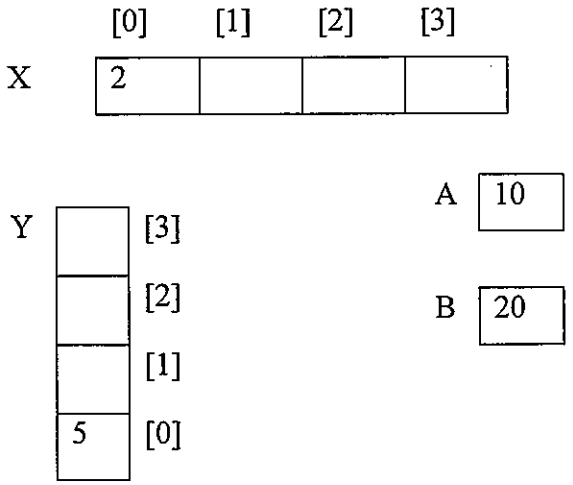
Table 2

i) Fill in the link in **Table 2** to maintain the list in descending order. Take index 0 as the start and index 99 as dummy to represent the end of list. (5 marks)

ii) Based on the answer in **d(i)**, draw an updated table after data **15** is added. (1 mark)

iii) Based on the answer in **d(ii)**, draw an updated table after data **10** is deleted. (1 mark)

e) *X* is a queue of integers with four elements and *Y* is a stack of integers with four elements. There are two integers *A* and *B*. (6 marks)



Continued ...

Draw the sequence diagrams of ***A***, ***B***, ***X*** and ***Y*** after each of the following operations:

i) Y.push(X.serve())

ii) X.append (B + 5)

iii) B = Y.pop() * 2

iv) Y.push(A + B)

v) if (X.serve()>Y.pop())

X.append(Y.pop())

[Total 25 marks]

QUESTION 3

a) By using binary search, show step by step on how to find the target '**20**' in the list given below. (13 marks)

int Table [] = {132,105,88,64,62,53,33,15,6}, target, first, last, mid;

b) By using Linear Probing method, resolved the collision that is shown below.

31 100 63 14 168 72 53 97

The hashing functions is given by h(i) = i mod 8. Show the index for each key and the result of the hash table. (10 marks)

c) List any **FOUR** types of sorting techniques. (2 marks)

[Total 25 marks]

Continued ...

QUESTION 4

a) Based on the string given below,

J, E, O, H, T, M, D, S, V, F

i) Create a binary search tree from the given string. (5 marks)

ii) List the **leaf** nodes. (2 marks)

iii) Write the *InOder Traversal*. (3 marks)

iv) Redraw a new updated binary tree after '**K**' is inserted and '**H**' is deleted from the binary tree. (3 marks)

v) Write the *PostOrder Traversal* from the new drawn binary tree in **a(iv)**. (3 marks)

b) Draw a directed graph from the given Incidence Matrix and Adjacency Matrix.

	x1	x2	x3	x4	x5	x6	x7	x8
A	1	1	0	0	0	0	0	0
B	1	1	1	1	1	0	0	0
C	0	0	1	0	0	0	1	0
D	0	0	0	0	0	0	0	0
E	0	0	0	0	1	1	0	0
F	0	0	0	1	0	1	1	1

Incidence Matrix

	A	B	C	D	E	F
A	0	2	0	0	0	0
B	0	0	1	0	1	0
C	0	0	0	0	0	1
D	0	0	0	0	0	0
E	0	0	0	0	0	1
F	0	1	0	0	0	2

Adjacency Matrix

(9 marks)

[Total 25 marks]

End of Page.